

Care of the Endocrine System

- Diabetes
 - Medical management plan
 - Blood glucose testing
 - Glucagon
 - Urine ketones
 - Insulin
 - Insulin pump therapy
 - Resources

Diabetes

Overview

Diabetes is a chronic disease in which the body does not make or properly use insulin, a hormone needed to convert sugar, starches, and other food into energy. People with diabetes have increased blood glucose (sugar) levels because they lack insulin, have insufficient insulin, or are resistant to insulin's effects. High levels of glucose build up in the blood and spill into the urine; as a result, the body loses its main source of fuel.

When insulin is no longer made, it must be obtained from another source—insulin shots or insulin pump. When the body does not use insulin properly, oral medications may be taken instead of, or in addition to, insulin shots. Neither insulin nor other medications, however, are cures for diabetes: they only help control the disease.

Taking care of diabetes is important. If not treated, diabetes can lead to serious health problems. The disease can affect the blood vessels, eyes, kidneys, nerves, gums, and teeth, and it is the leading cause of adult blindness, lower limb amputations, and kidney failure. People with diabetes also have a higher risk of heart disease and stroke. Some of these problems can occur in teens and young adults who develop diabetes during childhood. The good news is that research shows that these problems can be greatly reduced or delayed by keeping blood glucose levels near normal.

Types of Diabetes

Type 1. Type 1 diabetes mellitus (T1DM) is a complex metabolic disease. In people with T1DM, the immune system attacks the beta cells (the insulin-producing cells of the pancreas) and destroys them. Because the pancreas can no longer produce insulin, people with type 1 diabetes need to take insulin daily to live. T1DM can occur at any age, but it begins most often in children and young adults. T1DM can not be prevented.

Symptoms

- Increased thirst and urination
- Constant hunger
- Weight loss
- Blurred vision
- Fatigue

Risk Factors

- Genetics
- Environment

Type 2. The first step in the development of type 2 diabetes mellitus (T2DM) is often a problem with the body's response to insulin, or insulin resistance. For reasons scientists do not completely understand, the body cannot use its insulin very well. This means that the body needs increasing amounts of insulin to control blood glucose. The pancreas tries to make more insulin, but after several years, insulin production may drop off.

T2DM used to be found mainly in overweight adults ages 40 or older. Now, as more children and adolescents in the United States become overweight and inactive, T2DM occurs more often in young people. To control their diabetes, children with T2DM may need to take oral medication, insulin, or both. The risk of getting T2DM can be decreased by avoiding obesity through healthy diet and plenty of exercise.

Symptoms

- Fatigue
- Increased thirst and urination
- Nausea
- Rapid weight loss
- Blurred vision
- Frequent infections
- Slow healing of wounds or sores

Risk Factors

- Being overweight (greater than 85th percentile for height/weight)
- Having a family member who has type 2 diabetes
- Being African American, Hispanic/Latino American, Native American, Asian American or Pacific Islander American

Understanding Diabetes and Ketoacidosis

The pancreas makes enzymes and hormones. Insulin is a hormone secreted by the beta cells of the pancreas. Insulin goes straight into the blood and enables glucose to enter other cells of the body. Enzymes help digest or breakdown the food into glucose. Glucose is a simple sugar that is present in the blood and is used by the body for energy. When someone has diabetes, the pancreas doesn't make enough insulin. When there is not enough insulin, glucose cannot enter the cells.

Body cells need to have glucose to provide the energy to do their jobs. When glucose cannot be used for energy the level of glucose builds up in the blood stream. When excess glucose builds up in the blood, the kidneys filter it out into the urine. In the process the body uses and loses a lot of water. This causes increased thirst. Hunger is another symptom of diabetes caused by the body losing calories as a result of its inability to utilize the glucose from food that is consumed. This leads to weight loss and fatigue.

When the body can't use glucose, it uses its own fat and muscle tissue for energy. Ketones are acids that are left in the blood when fat is used for energy. Symptoms of nausea, vomiting, and eventually, coma occur. This is called *diabetic ketoacidosis*. The body will try to get rid of ketones through the kidneys and lungs. The ketones will show up in the urine and will also cause the breath to smell fruity.

Management of Diabetes

The goal of effective diabetes management is to control blood glucose levels by keeping them within a target range that is determined for each child. Optimal blood glucose helps to

promote normal growth and development and allows for optimal learning. Effective diabetes management is needed to prevent the immediate dangers of blood glucose levels that are too high or too low. As noted earlier, research has shown that maintaining blood glucose levels within the target range can prevent or delay the long-term complications of diabetes, such as heart attack, stroke, blindness, kidney failure, nerve disease, and amputations of the foot or leg.

The key to optimal blood glucose control is to carefully balance food, exercise, and insulin or medication. As a general rule, food makes blood glucose go up, and exercise and insulin make blood glucose levels go down. Several other factors, such as growth and puberty, mental stress, illness, or injury also can affect blood glucose levels. With all of these factors coming into play, maintaining good blood glucose control is a constant juggling act—24 hours a day, 7 days a week.

Monitoring Blood Glucose

Students with diabetes (usually T1DM) must check (or test) their blood glucose levels throughout the day by using a blood glucose meter. The meter gives a reading of the level of glucose in the blood at the time it is being checked. Monitoring involves pricking the skin with a lancet at the fingertip, forearm, or other test site to obtain a drop of blood and placing the drop on a special test strip that is inserted in a glucose meter. If blood glucose levels are too low (hypoglycemia) or too high (hyperglycemia), students can then take corrective action, such as eating, modifying their activity level, or administering insulin. ***Low blood glucose levels, which can be life-threatening, present the greatest immediate danger to people with diabetes.***

Health care providers generally recommend that students check their blood glucose during the school day, usually before eating lunch or snacks, before physical activity, or when there are symptoms of hypoglycemia or hyperglycemia. In young children, symptoms may be subtle; blood glucose should be checked whenever symptoms are suspected. Many students can check their own blood glucose level; others will need supervision; and others will need to have the entire task performed by a school nurse or trained diabetes personnel. Students who can self-check can be allowed to do so whenever they need to and at any school location. Being able to do so can help achieve better glucose control, independence in managing their diabetes, less stigma, and less time out of class. Frequency, supervision, and implementation of testing should be covered in the student's individualized health care plan.

Possible Causes of Hypoglycemia (Low Blood Glucose)

- Too much insulin
- Too little food
- Extra physical activity

Signs of Hypoglycemia—Low Blood Glucose	
<i>Mild Symptoms</i>	
<ul style="list-style-type: none"> • Hunger • Shakiness • Weakness • Paleness • Blurred vision • Increased heart rate/palpitations 	<ul style="list-style-type: none"> • Sleepiness • Changed behavior • Sweating • Anxiety • Dilated pupils
<i>Moderate to Severe Symptoms</i>	
<ul style="list-style-type: none"> • Yawning • Irritability/frustration • Extreme tiredness/fatigue • Inability to swallow • Sudden crying 	<ul style="list-style-type: none"> • Confusion • Restlessness • Dazed appearance • Having a seizure or convulsion • Unconsciousness/coma

Possible Causes of Hyperglycemia (High Blood Glucose)

- Too little insulin
- Expired insulin
- Food not covered by insulin
- Decreased physical activity
- Illness, injury
- Stress or emotions
- Other hormones
- Menstrual periods

Signs of Hyperglycemia—High Blood Glucose	
<i>Mild Symptoms</i>	
<ul style="list-style-type: none"> • Increased thirst • Increased urination • Dry mouth • Fatigue • Numbness or tingling • Agitation, fidgetiness, irritability 	<ul style="list-style-type: none"> • Increased hunger • Nausea • Blurred vision • Weakness • Lack of concentration
<i>Moderate Symptoms</i>	
<ul style="list-style-type: none"> • Decreased appetite • Nausea • Abdominal pain 	<ul style="list-style-type: none"> • Vomiting • Sunken eyes • Weight loss
<i>Severe Symptoms</i>	
<ul style="list-style-type: none"> • Continued vomiting • Sleepiness • Coma or unconsciousness 	<ul style="list-style-type: none"> • Very weak • Deep breathing, fruity smell • Possible ketones

Nutrition Planning

Although students with diabetes have the same nutritional needs as other students, there are special considerations for the school setting. Structured meals and snacks contribute to optimal glucose control and assist in preventing hypoglycemia. Timing of snacks is based on peak insulin action times (when the insulin is most effective in lowering the blood glucose). Therefore snacks must be allowed according to pre-scheduled daily snacks and/or for treatment of hypoglycemia. Students with diabetes usually have an individualized meal plan based upon carbohydrate counting or an exchange system. All meal plans are nutritionally sound and encourage the daily calorie requirements needed for optimal growth and development.

Carbohydrate counting involves calculating the number of grams of carbohydrate or choices of carbohydrate the student eats. This information, which can be obtained from nutrition information on food labels, is used to determine the amount of insulin the student needs to control blood glucose for any given meal or snack. Carbohydrate counting is the preferred method for determining food choices and portion sizes.

The exchange system groups foods in six different lists, each with a set nutritional value. A meal plan is prepared that recommends several exchanges or servings from each food group for each meal and snack. The exchange list ensures that the meal plan is consistent in portion size and nutrient content while offering a wide variety of foods from each group. Students using this approach consume a prescribed number of exchanges at meal and snack times. The exchange lists include the following food groups: (1) bread/starch, (2) fruit, (3) milk, (4) vegetables, (5) meat/protein foods, and (6) fats. The exchange system is not usually recommended for use in T1DM.

It is important for school personnel working with students who have diabetes to realize that any food eaten that contains carbohydrate must be worked into the meal plan, even if it is labeled “sugar free.” Also, some sugar substitutes add carbohydrates. They can make blood sugar rise if they are not eaten as part of a meal plan.

Physical Activity

Exercise and physical activity are critical parts of diabetes management. Everyone can benefit from regular exercise, but it is even more important for a student with diabetes. In addition to maintaining cardiovascular fitness and controlling weight, physical activity can help to lower blood glucose levels.

Students with diabetes should participate fully in physical education classes and team sports. To maintain blood glucose levels within their target ranges during extra physical activity, students may make adjustments in their insulin and food intake. To prevent hypoglycemia, they also may need to check their blood glucose levels more frequently while engaging in physical activity. General guidelines for blood glucose levels before exercise should be over 100 and under 250. When the blood glucose level is over 300, a test for ketones should be done (if authorized by the health care provider) before exercising. ***If ketones are positive, the student should not exercise.***

The student with diabetes should eat prior to exercising if it has been more than two hours since the student has eaten. It is best to exercise or take physical education classes 30-60 minutes after a meal to allow time for food to be absorbed. A person with diabetes always needs to have a fast-acting sugar and a complex carbohydrate readily available for treatment of low blood sugar, along with plenty of water. Physical education instructors and sports coaches should be able to recognize and assist with the treatment of hypoglycemia.

Exercise increases the flow of blood in general, but especially to the muscles that are being used the most. Insulin is absorbed faster when there is increased blood flow to the exercising muscles. For example, if the insulin is injected in the arm before a run or swim, it may be absorbed quickly and cause a low blood sugar. Muscles use stored energy while exercising and after exercise, the muscles need to replace this stored sugar. They do this by taking glucose out of the blood and this may continue for up to 12 hours after exercising.

Students using pumps may disconnect from the pump for sports activities. If they keep the pump on, they may set a temporary, reduced rate of insulin while they are playing. The student's individualized health care plan should include specific instructions for physical activity.

Implications for Education

Students with diabetes should have adequate time for taking medication, checking blood glucose, and eating and school personnel should help eliminate barriers to these activities. Students with hyperglycemia or hypoglycemia often do not concentrate well and blood glucose may need to be checked before and during academic testing. Students also may need to have additional access to food or drink and the restroom. If a serious high or low blood glucose episode occurs, a student may need to be excused with an opportunity for retake.

Planning for Disasters and Emergencies

In the event of natural disasters or other emergency situations, students may need to stay at school. **The family, therefore, must provide an emergency supply kit** containing a 72 hour supply of the following items as appropriate:

<ul style="list-style-type: none"> • Blood glucose meter, testing strips, lancets and batteries for meter • Urine ketones strips • Insulin and supplies • Insulin pump and supplies, including syringes • Other medications 	<ul style="list-style-type: none"> • Antiseptic wipes • Fast-acting source of glucose • Carbohydrate-containing snacks • Hypoglycemia food supplies (for 3 episodes): quick-acting sugar and carbohydrate/protein snacks • Glucagon emergency kit
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Parents must provide similar snacks and supplies for daily use.

Potential Settings

As with all medical conditions, every effort should be made to protect the student's privacy. It is important for students to be able to check their blood glucose levels and respond to levels that are too high to too low as quickly as possible. Accordingly, if recommended by the health care provider, students may be permitted to check their blood glucose level and respond to the results at any school location or at any school activity. Taking immediate action is important so that the symptoms don't get worse and students don't miss time in the classroom. **Blood glucose monitoring does not present a danger to other students or staff members when there is a plan for proper disposal of lancets and other materials that come into contact with blood.** The family and the school should agree on the plan, which should be consistent with Standard Precautions and local waste-disposal laws. The individualized health care plan should specify the level of supervision needed for testing and treatment.

Staff Preparation

The Code of Virginia (Section 22.1-274) requires that if one or more students are diagnosed with diabetes, at least one or two school employees (depending on the size of the school) must be trained to administer insulin and glucagon. The medical provider and parent must give written consent for any employee who is not a registered nurse, nurse practitioner, physician, or physician assistant to assist with the administration of insulin or glucagon. If a registered nurse, nurse practitioner, physician, or physician assistant is present, no other school employee may administer insulin or glucagon. All students with diabetes will need help with emergency medical care.

All school staff members, including bus drivers, who have responsibility for students with diabetes should receive training that provides a basic understanding of the disease and the students' needs, how to identify medical emergencies, and whom to contact in case of an emergency. Students also need a transportation plan.

Components of the Individualized Health Care Plan

Each student's IHCP must be tailored to the individual's needs. Students also need a transportation care plan. The following section covers procedures for diabetic management as well as possible problems and emergencies that may arise.

The National Diabetes Education Program recommends developing a plan with three components: (1) the Diabetes Medical Management Plan (DMMP), which contains the prescribed diabetes health care regimen, (2) a Quick Reference Emergency Plan describing how to recognize hypoglycemia and hyperglycemia and what to do as soon as signs of these conditions are observed, and (3) an education plan explaining what accommodations, education aids, and services are needed. A sample DMMP and Quick Reference Emergency Plan follow this section. They may be copied and used to develop a plan for each student. For a student with diabetes, the following items should receive particular attention:

Diabetes Medical Management Plan

- Date of diagnosis
- Current health status

- Emergency contact information
- Student's willingness and ability to perform self-management tasks at school
- Lists of diabetes equipment and supplies with schedule for quality control checks of equipment
- Specific medical orders
 - Blood glucose monitoring
 - Insulin, glucagon, and other medications to be given at school
 - Meal and snack plan
 - Exercise requirements
 - Additional monitoring, such as testing for ketones
- Typical signs, symptoms, and prescribed treatment for hypoglycemia
- Typical signs, symptoms, and prescribed treatment for hyperglycemia
- Latex allergy alert
- Standard precautions (Anticipating the tasks to be done, the risk involved, and the personal protective equipment needed will enhance protection of both the caregiver and student.)

Quick Reference Emergency Plan

- Symptoms of hypoglycemia and hyperglycemia
- Actions to take when hypoglycemia or hyperglycemia occur
- Emergency contact information and phone numbers

Education Plan

- Where and when blood glucose monitoring and treatment will take place
- Location of student's diabetes management supplies
- Identification of trained diabetes personnel who can conduct blood glucose checking, insulin and glucagon administration, and treatment of hypoglycemia and hyperglycemia
- Unrestricted access to the restroom and water fountain
- Nutritional needs, including provisions for meals and snacks
- Full participation in all school-sponsored activities and field trips, with coverage by trained diabetes personnel
- Alternative times for academic testing if student is experiencing hypoglycemia or hyperglycemia
- Flexible policies regarding absences for doctors' appointments and diabetes-related illness.
- Maintenance of confidentiality and the student's right to privacy

Sources:

American Diabetes Association. (2003). Care of Children with Diabetes in the School and Day Care Setting. (Position Statement). *Diabetes Care* 26: S131-S135.

American Diabetes Association, in partnership with Metropolitan Educational Cooperative Service Unit. (2003). *Diabetes Care Tasks At School: What Key Personnel Need To Know*. Available at www.diabetes.org/schooltraining.

- U.S. Department of Health and Human Resources, National Diabetes Education Program. (June 2003). *Helping the Student with Diabetes Succeed: A Guide for School Personnel*. NIH Publication No. 03-5217. Available at <http://www.ndep.nih.gov/resources/school.htm>.
- Zombeck, Mary, in partnership with the California Department of Education and the PADRE Foundation. (April 2002). *The Diabetes School Resource Guide: A guide for managing students with diabetes at school*. Available at www.pedsonline.org.

Date of Plan: _____

Diabetes Medical Management Plan

Effective Dates: _____

This plan should be completed by the student's personal health care team and parents/guardian. It should be reviewed with relevant school staff and copies should be kept in a place that is easily accessed by the school nurse, trained diabetes personnel, and other authorized personnel.

Student's Name: _____

Date of Birth: _____ Date of Diabetes Diagnosis: _____

Grade: _____ Homeroom Teacher: _____

Physical Condition: Diabetes type 1 Diabetes type 2

Contact Information

Mother/Guardian: _____

Address: _____

Telephone: Home _____ Work _____ Cell _____

Father/Guardian: _____

Address: _____

Telephone: Home _____ Work _____ Cell _____

Student's Doctor/Health Care Provider:

Name: _____

Address: _____

Telephone: _____ Emergency Number: _____

Other Emergency Contacts:

Name: _____

Relationship: _____

Telephone: Home _____ Work _____ Cell _____

Notify parents/guardian or emergency contact in the following situations:

Diabetes Medical Management Plan *Continued*

Blood Glucose Monitoring

Target range for blood glucose is	70-150	70-180	Other _____
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Usual times to check blood glucose _____

Times to do extra blood glucose checks (*check all that apply*)

before exercise

after exercise

when student exhibits symptoms of hyperglycemia

when student exhibits symptoms of hypoglycemia

other (explain):

Can student perform own blood glucose checks?	Yes	No

Exceptions: _____

Type of blood glucose meter student uses: _____

Insulin

Usual Lunchtime Dose

Base dose of Humalog/Novolog /Regular insulin at lunch (circle type of rapid-/short-acting insulin used) is _____ units or does flexible dosing using _____ units/ _____ grams carbohydrate.

Use of other insulin at lunch: (circle type of insulin used): intermediate/NPH/lente _____ units or basal/Lantus/Ultralente _____ units.

Insulin Correction Doses

Parental authorization should be obtained before administering a correction dose for high blood glucose levels. Yes No

_____ units if blood glucose is _____ to _____ mg/dl

units if blood glucose is to mg/dl

_____ units if blood glucose is _____ to _____ mg/dl

_____ units if blood glucose is _____ to _____ mg/dl

_____ units if blood glucose is _____ to _____ mg/dl

Can student give own injections?	Yes	No
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Can student determine correct amount of insulin?	Yes	No
1. Mr. Smith is a 65-year-old male with a long history of Type 2 Diabetes Mellitus. He is currently on a regimen of NPH insulin and regular insulin. His blood glucose levels are consistently high, ranging from 180 to 240 mg/dL. He has been experiencing frequent thirst and increased urination. His doctor has prescribed a new insulin regimen. The prescription reads: NPH insulin 30 units twice daily and regular insulin 1 unit per 10 mg/dL above 180 mg/dL. The student is asked to calculate the total units of insulin for the first dose.		
2. Mrs. Jones is a 55-year-old female with Type 2 Diabetes Mellitus. She is currently on a regimen of NPH insulin and regular insulin. Her blood glucose levels are consistently high, ranging from 160 to 200 mg/dL. She has been experiencing frequent thirst and increased urination. Her doctor has prescribed a new insulin regimen. The prescription reads: NPH insulin 20 units twice daily and regular insulin 1 unit per 10 mg/dL above 160 mg/dL. The student is asked to calculate the total units of insulin for the first dose.		
3. Mr. Brown is a 70-year-old male with Type 2 Diabetes Mellitus. He is currently on a regimen of NPH insulin and regular insulin. His blood glucose levels are consistently high, ranging from 140 to 180 mg/dL. He has been experiencing frequent thirst and increased urination. His doctor has prescribed a new insulin regimen. The prescription reads: NPH insulin 15 units twice daily and regular insulin 1 unit per 10 mg/dL above 140 mg/dL. The student is asked to calculate the total units of insulin for the first dose.		
4. Mrs. Green is a 60-year-old female with Type 2 Diabetes Mellitus. She is currently on a regimen of NPH insulin and regular insulin. Her blood glucose levels are consistently high, ranging from 120 to 160 mg/dL. She has been experiencing frequent thirst and increased urination. Her doctor has prescribed a new insulin regimen. The prescription reads: NPH insulin 10 units twice daily and regular insulin 1 unit per 10 mg/dL above 120 mg/dL. The student is asked to calculate the total units of insulin for the first dose.		
5. Mr. White is a 75-year-old male with Type 2 Diabetes Mellitus. He is currently on a regimen of NPH insulin and regular insulin. His blood glucose levels are consistently high, ranging from 100 to 140 mg/dL. He has been experiencing frequent thirst and increased urination. His doctor has prescribed a new insulin regimen. The prescription reads: NPH insulin 5 units twice daily and regular insulin 1 unit per 10 mg/dL above 100 mg/dL. The student is asked to calculate the total units of insulin for the first dose.		

Can student draw correct dose of insulin?	Yes	No
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_____ Parents are authorized to adjust the insulin dosage under the following circumstances:_____

For Students With Insulin Pumps

Type of pump: _____ Basal rates: _____ 12 am to _____
 _____ to _____
 _____ to _____

Type of insulin in pump: _____

Type of infusion set: _____

Insulin/carbohydrate ratio: _____ Correction factor: _____

Diabetes Medical Management Plan *Continued*

Student Pump Abilities/Skills:

Needs Assistance

Count carbohydrates	Yes	No
Bolus correct amount for carbohydrates consumed	Yes	No
Calculate and administer corrective bolus	Yes	No
Calculate and set basal profiles	Yes	No
Calculate and set temporary basal rate	Yes	No
Disconnect pump	Yes	No
Reconnect pump at infusion set	Yes	No
Prepare reservoir and tubing	Yes	No
Insert infusion set	Yes	No
Troubleshoot alarms and malfunctions	Yes	No

For Students Taking Oral Diabetes Medications

Type of medication: _____ Timing: _____

Other medications: _____ Timing: _____

Meals and Snacks Eaten at School

Is student independent in carbohydrate calculations and management? Yes No

<i>Meal/Snack</i>	<i>Time</i>	<i>Food content/amount</i>
Breakfast	_____	_____
Mid-morning snack	_____	_____
Lunch	_____	_____
Mid-afternoon snack	_____	_____
Dinner	_____	_____

Snack before exercise? Yes No

Snack after exercise? Yes No

Other times to give snacks and content/amount: _____

Preferred snack foods: _____

Foods to avoid, if any: _____

Instructions for when food is provided to the class (e.g., as part of a class party or food sampling event):

Exercise and Sports

A fast-acting carbohydrate such as _____ should be available at the site of exercise or sports.

Restrictions on activity, if any: _____

Student should not exercise if blood glucose level is below _____ mg/dl or above _____ mg/dl or if moderate to large urine ketones are present.

Diabetes Medical Management Plan *Continued*

Hypoglycemia (Low Blood Sugar)

Usual symptoms of hypoglycemia: _____

Treatment of hypoglycemia: _____

Glucagon should be given if the student is unconscious, having a seizure (convulsion), or unable to swallow. Route_____, Dosage_____, site for glucagon injection: _____arm, _____thigh, _____other. If glucagon is required, administer it promptly. Then, call 911 (or other emergency assistance) and the parents/guardian.

Hyperglycemia (High Blood Sugar)

Usual symptoms of hyperglycemia: _____

Treatment of hyperglycemia: _____

Urine should be checked for ketones when blood glucose levels are above _____ mg/dl.

Treatment for ketones: _____

Supplies to be Kept at School

_____ Blood glucose meter, blood glucose test strips, batteries for meter	_____ Insulin pump and supplies
_____ Lancet device, lancets, gloves, etc.	_____ Insulin pen, pen needles, insulin cartridges
_____ Urine ketone strips	_____ Fast-acting source of glucose
_____ Insulin vials and syringes	_____ Carbohydrate containing snack
	_____ Glucagon emergency kit

Signatures

This Diabetes Medical Management Plan has been approved by:

Student's Physician/Health Care Provider

Date

I give permission to the school nurse, trained diabetes personnel, and other designated staff members of _____ school to perform and carry out the diabetes care tasks as outlined by _____'s Diabetes Medical Management Plan. I also consent to the release of the information contained in this Diabetes Medical Management Plan to all staff members and other adults who have custodial care of my child and who may need to know this information to maintain my child's health and safety.

Acknowledged and received by:

Student's Parent/Guardian

Date

Student's Parent/Guardian

Date

Source: U.S. Department of Health and Human Resources, National Diabetes Education Program. (June 2003). *Helping the Student with Diabetes Succeed: A Guide for School Personnel*. NIH Publication No. 03-5217, pages 49-52.

Quick Reference Emergency Plan

for a Student with Diabetes

Hypoglycemia (Low Blood Sugar)

Photo

Student's Name _____

Grade/Teacher _____

Date of Plan _____

Emergency Contact Information:

Mother/Guardian _____

Father/Guardian _____

Home phone _____

Work phone _____

Cell _____

Home phone _____

Work phone _____

Cell _____

School Nurse/Trained Diabetes Personnel _____

Contact Number(s) _____

Never send a child with suspected low blood sugar anywhere alone.

Causes of Hypoglycemia

- Too much insulin
- Missed food
- Delayed food
- Too much or too intense exercise
- Unscheduled exercise

Onset

- Sudden

Symptoms

Mild

- Hunger
- Shakiness
- Weakness
- Paleness
- Anxiety
- Irritability
- Dizziness
- Sweating
- Drowsiness
- Personality change
- Inability to concentrate
- Other: _____

Circle student's usual symptoms.

Moderate

- Headache
- Behavior change
- Poor coordination
- Blurry vision
- Weakness
- Slurred Speech
- Confusion
- Other: _____

Circle student's usual symptoms.

Severe

- Loss of consciousness
- Seizure
- Inability to swallow

Circle student's usual symptoms.

Actions Needed

Notify School Nurse or Trained Diabetes Personnel. If possible, check blood sugar, per Diabetes Medical Management Plan. When in doubt, always TREAT FOR HYPOGLYCEMIA.

Mild

- Student may/may not treat self.
- Provide quick-sugar source.
 - 3-4 glucose tablets
 - or
 - 4 oz. juice
 - or
 - 6 oz. regular soda
 - or
 - 3 teaspoons of glucose gel
- Wait 10 to 15 minutes.
- Recheck blood glucose.
- Repeat food if symptoms persist or blood glucose is less than _____.
- Follow with a snack of carbohydrate and protein (e.g., cheese and crackers).

Moderate

- Someone assists.
- Give student quick-sugar source per MILD guidelines.
- Wait 10 to 15 minutes.
- Recheck blood glucose.
- Repeat food if symptoms persist or blood glucose is less than _____.
- Follow with a snack of carbohydrate and protein (e.g., cheese and crackers).

Severe

- Don't attempt to give anything by mouth.
- Position on side, if possible.
- Contact school nurse or trained diabetes personnel.
- Administer glucagon, as prescribed.
- Call 911.
- Contact parents/guardian.
- Stay with student.

Quick Reference Emergency Plan

for a Student with Diabetes

Hyperglycemia (High Blood Sugar)

Photo

Student's Name _____

Grade/Teacher _____

Date of Plan _____

Emergency Contact Information:

Mother/Guardian _____

Father/Guardian _____

Home phone _____

Work phone _____

Cell _____

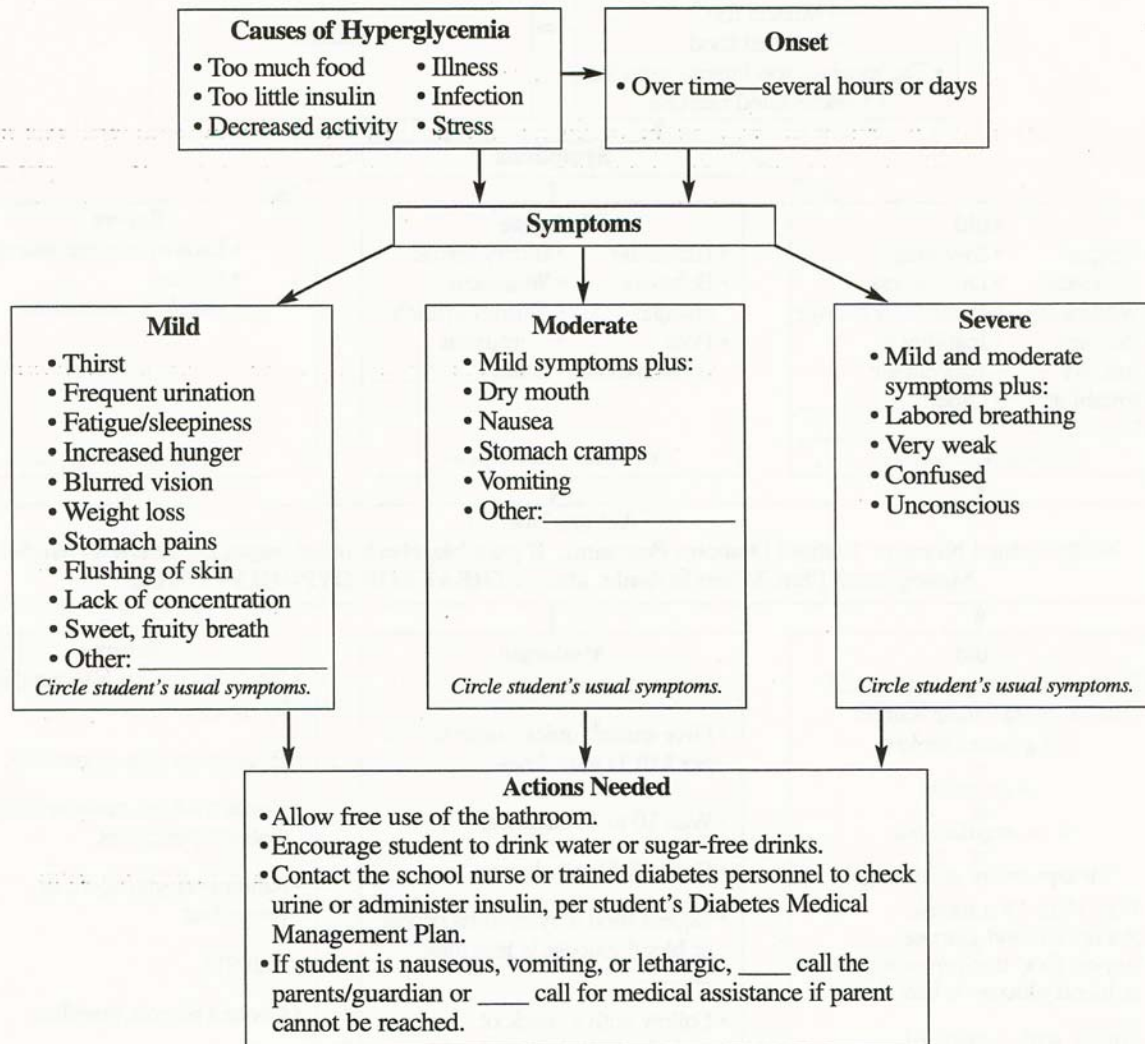
Home phone _____

Work phone _____

Cell _____

School Nurse/Trained Diabetes Personnel _____

Contact Number(s) _____



Source: U.S. Department of Health and Human Resources, National Diabetes Education Program. (June 2003). *Helping the Student with Diabetes Succeed: A Guide for School Personnel*. NIH Publication No. 03-5217, pages 53, 54.

Procedure for Blood Glucose Testing

Note: Parent provides necessary equipment and supplies.

1. Review directions for blood testing meter if not familiar with it.
2. Wash hands.
3. Assemble equipment:
 - Alcohol prep pad
 - Finger lancing device
 - Blood glucose testing meter (for example, Accucheck Advantage, Bayer Elite, Lifescan UltraOne Touch, Therasense Freestyle, etc.)
 - Blood testing strips for specific electronic meter
 - Tissue or cotton balls or spot bandage
 - Gloves
 - Student log
4. Wash hands and area to be tested with soap and water. If the caregiver is performing the procedure, put on gloves. Washing student's hands and test site is sufficient for prepping the site; however, alcohol may be used for further prepping. The site selected **must** be dry before pricking.

Alcohol may cause toughening of the skin or burning sensation. If moisture (water or alcohol) remains on the skin it may alter test results.
5. Place glucose testing strip into electronic meter according to manufacturer's instructions.
6. Prepare lancing device according to manufacturer's instructions.

If school personnel are performing the procedure, then a disposable lancing device must be used. Some of the new meters allow testing on forearms. The lancet device used for forearm testing is not disposable; therefore, the child may only use the forearm if independently able to use the lancing device.
7. Select a site. If using finger, use the top sides of fingertips. Hang the arm below the level of the heart for 30 seconds to increase blood flow.

The tips of the fingertips may be more sensitive.
8. Puncture the site with the lancing device. Gently squeeze the finger in a downward motion to obtain a large enough drop of blood to cover the test pad on the test strip.

Avoid squeezing the site excessively because excess squeezing can contaminate the sample with tissue fluid and causes hemolysis of sample and trauma to the site.
9. Place blood on testing strip and complete instructions according to manufacturer's instructions. Compress lanced area with tissue or cotton ball until bleeding stops.
10. Dispose of test strip and tissue or cotton ball in lined wastebasket. Dispose of lancing device in Sharps container.
11. Remove and dispose of gloves. Wash hands.
12. Record results in student log. Refer to student's individualized health care plan for actions. Refer to the "Quick Reference Emergency Plans" on the preceding two pages for sample actions.

Sources:

- American Diabetes Association, in partnership with Metropolitan Educational Cooperative Service Unit. (2003). *Diabetes Care Tasks At School: What Key Personnel Need To Know*. Available at www.diabetes.org/schooltraining.
- Zombeck, Mary, in partnership with the California Department of Education and the PADRE Foundation. (April 2002). *The Diabetes School Resource Guide: A guide for managing students with diabetes at school*. Available at www.pedsonline.org.

Procedure for Mild or Moderate Low Blood Glucose

<i>Mild Symptoms</i>	<i>Moderate Symptoms</i>
<ul style="list-style-type: none"> • Hunger • Shakiness • Weakness • Paleness • Anxiety • Irritability • Sweating • Drowsiness • Personality change • Inability to concentrate • Dizziness 	<ul style="list-style-type: none"> • Headache • Behavior change • Poor coordination • Blurred vision • Slurred speech • Confusion

1. Observe/Recognize signs of low blood glucose. Ask student to describe how he/she feels. Refer to student's individualized health care plan, if possible.

If student is unable to swallow, combative, uncooperative, unconscious, or having a seizure, proceed immediately to Procedure for Severe Low Glucose.

Factors Which Can Lead to Low Blood Glucose

- Too much insulin
- Too little food
- Extra physical activity

To prevent hypoglycemia:

- **ALWAYS** keep a fast-acting carbohydrate source with the student.
 - Treat low blood glucose at the **onset** of symptoms.
 - Eat, take insulin, test blood glucose, and exercise at the prescribed times.
 - Have an up-to-date individualized health care plan from student's health care provider.
 - Ensure that food eaten matches insulin dosing. Watch picky eaters. Provide information to families about school meals, as well as snacks and classroom activities involving food.
 - Monitor blood glucose variations on "gym days" because an extra snack may be required ½ hour before physical education or during prolonged vigorous exercise.
 - Never leave a student unattended when low blood glucose is suspected.
2. Test blood for glucose. (See Procedure for Blood Glucose Testing.) If no blood glucose meter is available, treat immediately. **When in doubt, always treat.**
If moderate symptoms, provide immediate adult supervision during testing.
 3. **If blood glucose is below 80:** Have student eat or drink one of the following fast-acting carbohydrates:
 - 4 oz. (1/2 cup) fruit juice
 - 2-4 glucose tablets (chewed thoroughly before swallowing)
 - 6 ounces of regular (not diet) soda (about half a can)
 - 1 tube of glucose gel or cake decorating frosting

- 4-6 small hard candies
- 1-2 tablespoons of honey

Treat “on the spot.” **The student should never be left alone or sent anywhere alone when experiencing hypoglycemia.** Students should be permitted to carry source of glucose with them at all times.

If blood glucose is above 80 and student is not feeling well, repeat test to verify results.

4. Observe for 10-15 minutes, then recheck blood glucose.
5. If blood glucose is over 80 and student is feeling better:
 - Provide extra carbohydrate and protein snack if over 1 hour until lunch or snack time, if ordered in student’s individualized health care plan.
 - Resume classroom activities if fully recovered.
6. Repeat food if symptoms persist or blood glucose is less than 80.
7. If no improvement, call school nurse and family.
8. If pupil becomes unable to participate in care, proceed immediately to Emergency Procedure for Severe Blood Glucose.
9. Document actions.

Sources:

American Diabetes Association. (2003). Care of Children with Diabetes in the School and Day Care Setting. (Position Statement). *Diabetes Care* 26: S131-S135.

American Diabetes Association, in partnership with Metropolitan Educational Cooperative Service Unit. (2003). *Diabetes Care Tasks At School: What Key Personnel Need To Know*. Available at www.diabetes.org/schooltraining.

U.S. Department of Health and Human Resources, National Diabetes Education Program. (June 2003). *Helping the Student with Diabetes Succeed: A Guide for School Personnel*. NIH Publication No. 03-5217. Available at <http://www.ndep.nih.gov/resources/school.htm>.

Zombeck, Mary, in partnership with the California Department of Education and the PADRE Foundation. (April 2002). *The Diabetes School Resource Guide: A guide for managing students with diabetes at school*. Available at www.pedsonline.org.

Emergency Procedure for Severe Low Blood Glucose (Hypoglycemia/Insulin Reaction)

1. Verify signs of severe low blood glucose:

- Unable to swallow
- Unconscious
- Combative
- Uncooperative
- Having seizures

Signs are so severe that student cannot participate in care.

Factors Which Can Lead to Low Blood Glucose

- Too much insulin
- Too little food
- Extra physical activity

To prevent hypoglycemia:

- **ALWAYS** keep a fast-acting carbohydrate source with the student
- Treat low blood glucose at the **onset** of symptoms.
- Eat, take insulin, test blood glucose, and exercise at the prescribed times.
- Have an up-to-date individualized health care plan from student's health care provider.
- Ensure that food eaten matches insulin dosing. Watch picky eaters. Provide information to families about school meals, as well as snacks and classroom activities involving food.
- Monitor blood glucose variations on "gym days" because an extra snack may be required ½ hour before physical education or during prolonged vigorous exercise.

2. **Have someone call emergency medical services (911 in most areas), school nurse, and family. Student should not be left unattended.**

If seizure occurs, follow procedure for Managing a Seizure.

3. Place student on side or in upright position if restless/uncooperative.

If on side, maintain head position to one side to prevent aspiration

4. Do not attempt to give food or put anything in the student's mouth.

Student may aspirate or choke.

5. Give glucagon injection, if ordered in student's individualized health care plan. See Procedure for Giving Glucagon on next page.

6. If student becomes alert after receiving glucagon, stay with student until emergency services arrive. Student may be given sips of fruit juice or regular soda once awake and able to drink.

7. Document in student log.

Sources:

American Diabetes Association. (2003). Care of Children with Diabetes in the School and Day Care Setting. (Position Statement). *Diabetes Care* 26: S131-S135.

American Diabetes Association, in partnership with Metropolitan Educational Cooperative Service Unit. (2003). *Diabetes Care Tasks At School: What Key Personnel Need To Know*. Available at www.diabetes.org/schooltraining.

Zombeck, Mary, in partnership with the California Department of Education and the PADRE Foundation. (April 2002). *The Diabetes School Resource Guide: A guide for managing students with diabetes at school*. Available at www.pedsonline.org.

Glucagon

Definition

Glucagon is a hormone that occurs naturally in the body. It is produced in the pancreas and raises blood glucose levels by causing the release of glycogen (a form of stored carbohydrate) from the liver that raises blood glucose levels.

Purpose

Glucagon injections are prescription medications used to treat serious hypoglycemia. If it is specified in the student's individualized health care plan, glucagon should be used when the student is unconscious, having seizures, or cannot eat or drink safely. Severe hypoglycemia can cause brain damage or death.

Although it may cause nausea and vomiting when the student regains consciousness, glucagon is a life-saving treatment that cannot harm a student.

Storage

The glucagon kit should be stored at room temperature in a place designated by the student's individualized health care plan. It may be kept by the student. The expiration date should be checked and it should not be administered if expired, discolored, or does not dissolve well. It should not be mixed until it needs to be given. Combine the glucagon for injection immediately before use by following the instructions that are included with the glucagon kit. (Expired glucagon kits can be used for training sessions.)

Source:

American Diabetes Association, in partnership with Metropolitan Educational Cooperative Service Unit. (2003). *Diabetes Care Tasks At School: What Key Personnel Need To Know*. Available at www.diabetes.org/schooltraining.

Procedure for Giving Glucagon for Severe Hypoglycemia

Note: Parent provides necessary equipment, supplies, and medications.

1. Verify signs of severe low blood glucose:

- Unable to swallow
- Unconscious
- Combative
- Uncooperative
- Having seizures

Signs are so severe that student cannot participate in care.

2. **Have someone call emergency medical services (911), school nurse, and family.**

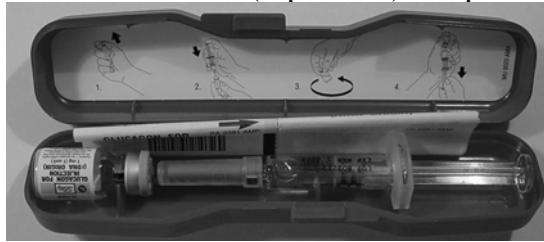
Student should not be left unattended.

If seizure occurs, follow procedure for Managing a Seizure.

3. Place pupil on side or in upright position if restless/uncooperative.

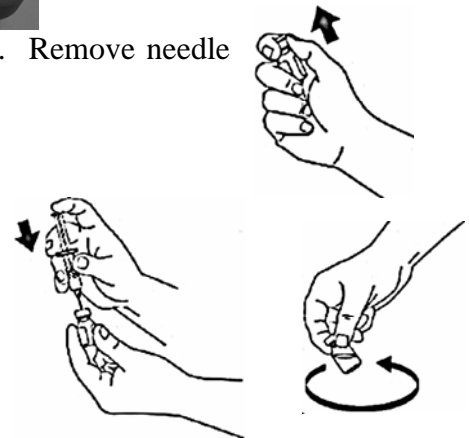
If on side, maintain head position to one side to prevent aspiration

4. Obtain glucagon kit. Wash hands (if possible) and put on gloves.



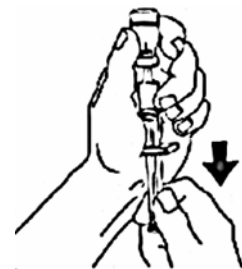
5. Flip cap off glass vial (bottle) containing dry powder. Remove needle cover from syringe.

6. Take the fluid-filled syringe in the glucagon emergency kit and inject the fluid into the vial containing the glucagon powder. Shake gently or roll to mix until all powder is dissolved and solution is clear. Inspect medication for color, clarity, and presence of lumps. Solution should be clear and colorless.



7. Hold vial upside down and withdraw a prescribed amount of glucagon back into the syringe. The prescribed amount should be specified in the student's individualized health care plan. Withdraw needle from vial.

Generally, if the student weighs >45 pounds, the full vial (1 cc) of glucagon may be injected. If the child weighs <45 pounds, inject ½ of the solution.



8. When possible, the injection site should be exposed and cleaned. However, glucagon can be administered through clothing, if necessary. Suggested sites include the outer thigh, upper outer buttock, or arm.
9. Inject needle straight into muscle of site and inject glucagon.
10. Withdraw needle and press site with cotton ball or wipe. Massage injection site for 10 seconds; apply bandage if needed.

11. Do not recap syringe. Put used syringe in sharps container.
12. Stay with student. It may take 15-20 minutes for student to regain consciousness.
13. Recheck blood sugar. Follow student's specific instructions for response to results.
Some students may have a second injection of glucagon ordered if glucose remains low.
14. Student may be given sips of fruit juice or regular soda once awake and able to drink.
May follow with snack containing proteins and carbohydrates such as peanut butter sandwich or cheese crackers to keep blood sugar levels elevated to normal levels and to prevent recurrence.
15. Don't be surprised if student does not remember being unconscious, incoherent or has a headache. Blood sugar may also rise over 200 and nausea or vomiting may occur.
Glucagon can cause nausea/vomiting.
16. When emergency services arrive, student to be transported for medical care.
17. Document in student log.

Sources:

- American Diabetes Association, in partnership with Metropolitan Educational Cooperative Service Unit. (2003). *Diabetes Care Tasks At School: What Key Personnel Need To Know*. Available at www.diabetes.org/schooltraining.
- Zombeck, Mary, in partnership with the California Department of Education and the PADRE Foundation. (April 2002). *The Diabetes School Resource Guide: A guide for managing students with diabetes at school*. Available at www.pedsonline.org.

Procedure for High Blood Glucose (Hyperglycemia)

1. Observe/Recognize signs of high blood glucose, although student may frequently be asymptomatic:

Mild Symptoms

- Increased thirst
- Increased urination
- Dry mouth
- Fatigue
- Numbness or tingling
- Agitation, fidgetiness, irritability
- Hunger
- Nausea
- Blurred vision
- Weakness

Moderate Symptoms

- Decreased appetite
- Nausea
- Abdominal pain/stomach cramps
- Vomiting
- Sunken eyes
- Weight loss
- Dry mouth

Severe Symptoms

- Continue vomiting
- Sleepiness
- Coma or unconsciousness
- Deep breathing, fruity smell
- Possible ketones

Factors Which Can Lead to High Blood Glucose (hyperglycemia):

- | | |
|-------------------------------------|----------------------|
| • Too little insulin | • Illness, injury |
| • Expired insulin | • Stress or emotions |
| • Too much food (for insulin taken) | • Other hormones |
| • Decreased physical activity | • Menstrual periods |
| • Any combination of the above | |

To prevent hyperglycemia:

- Eat, take insulin, test blood glucose, and exercise at the prescribed times.
- Have an up-to-date individualized health care plan from student's health care provider.
- Ensure that food eaten matches insulin dosing. Monitor food intake. Report binge eating.

- Provide information to families about school meals, as well as snacks and classroom activities involving food. Consult family when snack, meal, or exercise times must be changed and prior to extra snacks.
 - Take appropriate action if a missed dose is suspected or if an insulin pump malfunctions.
 - Avoid “overtreating” low blood sugar reactions.
 - Respect the student; realize their limits.
2. Test blood glucose. (See Procedure for Blood Glucose Testing)
 3. **Initiate care per health care provider’s orders for high blood glucose.** This may include insulin administration, checking for ketones, and possibly activity restriction (exercising when ketones are present may elevate blood glucose levels even further). Insulin administration during hyperglycemia may be referred to as a “sliding scale insulin” order. Refer to student’s individualized health care plan.
 4. Check urine ketones if blood glucose >250. See Procedure for Testing Urine Ketones on next page.
 5. Encourage student to drink water, generally 16-24 ounces over 2 hours or 8 ounces per hour. Allow unrestricted use of the bathroom.
If student resumes classroom activities, he/she may need to use a water bottle in class to ensure adequate fluid intake.
 6. If student is feeling okay, he or she may resume classroom activities. If student does not feel well (nausea, lethargy, headache), then the family should be called.
 7. Recheck blood glucose according to student’s individualized health care plan.
 8. If the student develops severe stomach pains, vomiting and/or rapid breathing, call emergency medical services, school nurse, and family immediately.
 9. Document care in student log.

Sources:

- American Diabetes Association. (2003). Care of Children with Diabetes in the School and Day Care Setting. (Position Statement). *Diabetes Care* 26: S131-S135.
- American Diabetes Association, in partnership with Metropolitan Educational Cooperative Service Unit. (2003). *Diabetes Care Tasks At School: What Key Personnel Need To Know*. Available at www.diabetes.org/schooltraining.
- U.S. Department of Health and Human Resources, National Diabetes Education Program. (June 2003). *Helping the Student with Diabetes Succeed: A Guide for School Personnel*. NIH Publication No. 03-5217. Available at <http://www.ndep.nih.gov/resources/school.htm>.
- Zombeck, Mary, in partnership with the California Department of Education and the PADRE Foundation. (April 2002). *The Diabetes School Resource Guide: A guide for managing students with diabetes at school*. Available at www.pedsonline.org.

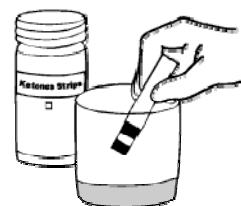
Procedure for Testing Urine Ketones

When the body can't use glucose, it uses its own fat and muscle tissue for energy. Ketones are acids that are left in the blood when fat is used for energy. Symptoms of nausea, vomiting, and eventually, coma occur. This is called *diabetic ketoacidosis*, also referred to as "DKA," and may occur with hyperglycemia.

The body will try to get rid of ketones through the kidneys and lungs. The ketones will show up in the urine and will also cause the breath to smell fruity. Other symptoms include nausea, vomiting, and drowsiness. If testing for urine ketones shows medium or large ketones present, extra insulin may be needed, if specified in the student's individualized health care plan, to reduce the level of ketones.

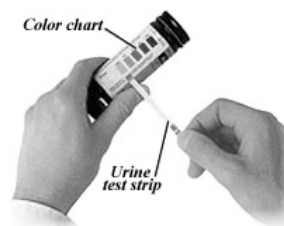
If ketones are not detected early, particularly during illness, they will build up in the body and DKA may result. DKA is the number one reason for hospitalizing children with diabetes. Early detection of ketones and treatment helps to prevent hospitalizations for DKA.

1. Review directions for urine ketone testing if not familiar with it. Wash hands.
2. Assemble equipment:
 - Bottle of ketone strips
 - Urine cup
3. Saturate the test strip with urine by one of the following methods:
 - Student urinates in cup, and then test strip is dipped into urine.
 - Student holds test strip in urine flow.

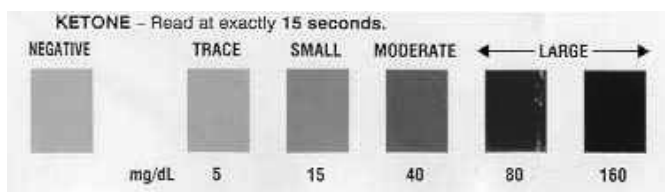


If assisting the student, wear disposable gloves during this procedure.

4. Dip the ketone test strip in the cup containing urine.
5. Wait the exact amount of time for test strip to develop, per directions on test strip bottle (usually 15-60 seconds).
6. Compare color of strip to chart on bottle. Results will be read as negative, small, moderate, or large. Refer to student's individualized health care plan for actions.



Generally, if results are moderate or large, student should not engage in physical activity and family should be called to take student home for observation and/or medical care. If urine ketone results are trace or small, increase fluid intake.



7. Record results in student log.

Sources:

American Diabetes Association, in partnership with Metropolitan Educational Cooperative Service Unit. (2003). *Diabetes Care Tasks At School: What Key Personnel Need To Know*. Available at www.diabetes.org/schooltraining

Zombeck, Mary, in partnership with the California Department of Education and the PADRE Foundation. (April 2002). *The Diabetes School Resource Guide: A guide for managing students with diabetes at school*. Available at www.pedsonline.org.

Insulin

Definition

Insulin is a hormone constructed of proteins that is normally produced by the pancreas. Synthetically manufactured insulin is produced for the person with diabetes who lacks this hormone. Several days without insulin can cause a life-threatening condition of ketoacidosis, coma, and eventually death.

Storage

Insulin can be affected by extremes in temperature, which can denature the protein and decrease or eliminate its effect. Insulin remains stable at temperatures between 40-75 degrees. Once insulin is opened, the date should be written on the vial. **Refer to student's individualized health care plan for instructions regarding storage.** Opened vials of insulin are sometimes left at room temperature for 30 days after opening, but will keep for 3 months if refrigerated. Some health care providers recommend storing any opened insulin in the refrigerator and using for one month. Unopened vials that are stored in the refrigerator are good until the expiration date. Refer also to manufacturer's instructions to ensure proper storage.

Dosage and Administration

Insulin doses are measured in "units." There are 10 milliliters in one vial of insulin, which is equivalent to 1000 units. One unit of insulin can alter a blood glucose level; therefore, **it is imperative that the ordered dosage be EXACT!**

The number of insulin units to be given is ordered by the child's licensed health care provider--physician or nurse practitioner. The amount or dose of insulin will depend on several factors: body size, blood glucose levels, meal plan, and exercise. A sliding scale may be used, that is, the number of insulin units to be given is based on the blood glucose reading.

Insulin injections are given subcutaneously (area between the skin and the muscle). Sites should be rotated to avoid scar tissue or fatty cell growth under the skin.

Types of Insulin

Insulin can be classified as rapid-acting, short-acting, intermediate-acting, or long-acting. The different types vary in onset of action (length of time the insulin takes to start working), peak action (when the insulin has its strongest effect), and duration of action (the length of time the insulin usually lasts). Rapid-acting and short-acting insulin can be used for meal coverage or "spot dosing" and correction doses (doses given in order to decrease an elevated blood glucose). If an *extra* dose of rapid or short-acting insulin is given, the blood glucose should be checked approximately 30 minutes to 2 hours later, or as specified in student's individualized health care plan. Correction or spot doses should not be given closer than 2 hours apart. Some insulin orders may call for the mixing of a short-acting insulin with a longer-acting insulin, but are usually not given during school hours. See chart below for insulin action times:

Insulin Action Times

Type of Insulin	Names	Onset of Action (how long before it starts to work)	Peak Action (when the insulin has the strongest effect)	Duration of Action (how long the insulin usually lasts)
Rapid-Acting	Lispro (Humalog)	5-15 minutes	30-90 minutes	2-4 hours
	Aspart (Novolog)	5-15 minutes	1-3 hours	2-4 hours
Short-Acting	Regular	30-60 minutes	2-3 hours	3-4 hours
Intermediate-Acting	NPH	2-4 hours	6-10 hours	10-18 hours
	Lente	3-4 hours	6-12 hours	12-20 hours
Long-Acting	Ultralente	6-10 hours	10-16 hours	18-24 hours
	Glarine (Lantus)	1 hour	peakless	24 hours

Insulin Delivery Systems

Insulin delivery methods include syringes, insulin pens, or insulin pumps. In addition, syringes can be attached to several types of spring-loaded aids which make injection easier. See procedure sections for insulin pens and insulin pumps for more information.

Interactions with other Medications

The school nurse should be notified if additional medication is being used by the student. Other medications can increase or decrease the effect of insulin.

Sources:

American Diabetes Association. (2003). Care of Children with Diabetes in the School and Day Care Setting. (Position Statement). *Diabetes Care* 26: S131-S135.

American Diabetes Association, in partnership with Metropolitan Educational Cooperative Service Unit. (2003). *Diabetes Care Tasks At School: What Key Personnel Need To Know*. Available at www.diabetes.org/schooltraining.

U.S. Department of Health and Human Resources, National Diabetes Education Program. (June 2003). *Helping the Student with Diabetes Succeed: A Guide for School Personnel*. NIH Publication No. 03-5217. Available at <http://www.ndep.nih.gov/resources/school.htm>.

Zombeck, Mary, in partnership with the California Department of Education and the PADRE Foundation. (April 2002). *The Diabetes School Resource Guide: A guide for managing students with diabetes at school*. Available at www.pedsonline.org.

Procedure for Insulin Administration by Syringe **(Injection of Regular or Humalog/Novolog Insulin - no mixing with other insulins)**

Staff training must be done by a registered nurse (preferably a certified diabetes educator) or physician (preferably an endocrinologist).

Note: Parent provides necessary equipment, supplies, and medications.

1. Wash hands.
2. Assemble equipment:
 - Vial of insulin
 - Syringe with needle (only use an insulin syringe)
 - Alcohol prep pad
 - Cotton balls or spot bandage (optional)
 - Gloves (if done by anyone other than student)
 - Sharps container
3. If insulin is cold, warm in the palm of hand to room temperature.
Injecting cold insulin can cause pain and may affect absorption.
4. If this is a new bottle of insulin, remove the flat, colored cap. Do not remove the rubber stopper or the metal band under the cap. Check expiration date of the vial of insulin.
5. Clean the rubber top of the insulin vial and let dry for a few seconds.
6. Remove the cap from the syringe. Fill the syringe with air equal to the number of units of insulin needed. Inject air into Regular or Humalog/Novolog insulin bottle with syringe remaining in bottle, invert and pull plunger back beyond the number of units desired. Keeping the syringe in an upright position, clear any air by pulling plunger back and tapping syringe to raise air bubbles to the top. Push plunger to desired amount of units, ensuring that no air bubbles remain and withdraw the syringe.
*Air is always injected into the vial to prevent creating a vacuum inside the vial as insulin is removed. **Air bubbles left in the syringe can alter the desired dose.***
7. Slip needle back into cap without touching cap or needle (see procedure for One-Handed Needle Recapping if syringe must be recapped). Select the site to be used and prep with alcohol and let dry. If area is dirty, wash with soap and water and dry.
Any subcutaneous tissue can be used for injection sites. The best absorption is in the lower abdomen, followed by the upper, outer arms, tops of the thighs and lastly the upper areas of the buttocks. Exercise and heat (like the warmth from a heating pad or whirlpool) also hastens absorption of an injected area.
8. Pinch up skin and tissue with one hand. With the other hand, hold the syringe, with the eye of the needle pointing upward, like a pencil. Dart the needle into the “soft pocket” (area that lies directly in front or in back of the pinched up skin) at a 90 degree angle. Inject insulin in one to five seconds. (Do not aspirate or pull back the plunger.) Release pinched up skin and remove needle while applying gentle pressure at the injection site for 10-15 seconds. This will help to prevent leakage from the site.
Take care to avoid injecting into the muscle, as it will hasten absorption. Do not massage the area as it irritates the tissue and hastens absorption.
9. Dispose of syringe with needle intact into a sharps container.
Recapping a needle can result in a needlestick injury.
10. Document in student log.

Sources:

- American Diabetes Association, in partnership with Metropolitan Educational Cooperative Service Unit. (2003). *Diabetes Care Tasks At School: What Key Personnel Need To Know*. Available at www.diabetes.org/schooltraining
- Zombeck, Mary, in partnership with the California Department of Education and the PADRE Foundation. (April 2002). *The Diabetes School Resource Guide: A guide for managing students with diabetes at school*. Available at www.pedsonline.org.

Procedure for Insulin Administration by Syringe

(Injection of Two Types of Insulin Together)

Staff training must be done by a registered nurse (preferably a certified diabetes educator) or physician (preferably an endocrinologist).

Note: Parent provides necessary equipment, supplies, and medications.

1. Wash hands.
2. Assemble equipment:
 - Vials of insulin
 - Syringe with needle (use only an insulin syringe)
 - Alcohol prep pad
 - Cotton balls or spot bandage (optional)
 - Gloves (if done by anyone other than student)
 - Sharps container
3. If insulin is cold, warm in the palm of hand to room temperature.
Injecting cold insulin can cause pain and may affect absorption.
4. If this is a new bottle of insulin, remove the flat, colored cap. Do not remove the rubber stopper or the metal band under the cap. Check expiration dates of the vials of insulin.
5. If NPH or Lente is used, it will require mixing. Gently roll the bottle between the palms or turn the bottle over from end to end a few times. Do not shake. If any clumps are visible, do not use.
Shaking can cause the protein to denature and decrease the potency. Clumps are an indication that the protein has been denatured.
6. Clean the rubber top of the insulin vial and let dry for a few seconds.
7. Remove the cap from the syringe. Fill the syringe with air equal to the number of units of intermediate or long-acting insulin needed. Keep the bottle upright and inject air into the intermediate or long-acting bottle. Pull empty syringe out of the bottle.
Air is always injected into the longer acting insulin first. Air is always injected into the vial to prevent creating a vacuum inside the vial as insulin is removed.
8. Inject air into Regular or Humalog/Novolog insulin bottle with syringe remaining in bottle, invert and pull plunger back beyond the number of units desired. Keeping the syringe in an upright position, clear any air by pulling plunger back and tapping syringe to raise air bubbles to the top. Push plunger to desired amount of units, ensuring that no air bubbles remain and withdraw the syringe.
Regular/Humalog/Novolog insulin is always drawn up first. This avoids potential contamination of longer acting insulin into the short acting (which could delay the action time of regular insulin. Air bubbles left in the syringe can alter the desired dose.
9. Inject needle into intermediate or long-acting insulin bottle and withdraw exact number of units to be given. Total number of units must equal the Regular/Humalog/Novolog unit dose plus the intermediate/long-acting insulin dose. Example: 5 u Regular and 10 u NPH equals 15 total units.
If there is any air in the syringe after withdrawing the needle, attempt to clear. If any insulin is inadvertently pushed out, the entire dose should be discarded and redrawn. Avoid pushing the plunger up in the intermediate/long-bottle to rid air. This could inadvertently push regular insulin up in to the intermediate/long-acting bottle and alter the entire dose.

10. Slip needle back into cap without touching cap or needle. (See Procedure for One-Handed Needle Recapping if syringe must be recapped.) Select the site to be used and prep with alcohol and let dry. If area is dirty, the wash with soap and water and dry. *Any subcutaneous tissue can be used for injection sites. The best absorption is in the lower abdomen, followed by the upper, outer arms, tops of the thighs and lastly the upper areas of the buttocks. Exercise and heat (like the warmth from a heating pad or whirlpool) also hastens absorption of an injected area.*
11. Pinch up skin and tissue with one hand. With the other hand, hold the syringe, with the eye of the needle pointing upward, like a pencil. Dart the needle into the “soft pocket” (area that lies directly in front or in back of the pinched up skin) at a 90 degree angle. Inject insulin in one to five seconds. (Do not aspirate or pull back the plunger.) Release pinched up skin and remove needle while applying gentle pressure at the injection site for 10-15 seconds. This will help to prevent leakage from the site. *Take care to avoid injecting into the muscle, as it will hasten absorption. Do not massage the area as it irritates the tissue and hastens absorption.*
12. Dispose of syringe with needle intact into a sharps container. *Recapping a needle can result in a needlestick injury*
13. Document in student log.

Sources:

- American Diabetes Association. (2003). Care of Children with Diabetes in the School and Day Care Setting. (Position Statement). *Diabetes Care* 26: S131-S135.
- American Diabetes Association, in partnership with Metropolitan Educational Cooperative Service Unit. (2003). *Diabetes Care Tasks At School: What Key Personnel Need To Know*. Available at www.diabetes.org/schooltraining.
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Procedure for Insulin Pen Delivery System

An insulin pen is an insulin delivery system that has the visual appearance of a writing pen; it consists of a cartridge holder (insulin must be purchased in prescribed cartridges), a piston rod (this is a screw mechanism that adjusts the desired dose), a dose indicator window (dose is indicated by visual numbers), a push button (this delivers the insulin), and a pen encasement. The purpose of an insulin pen is to provide insulin with a convenient and accurate device at school. Insulin pens will assist in preventing dose errors that may occur with a syringe and vial. Some pens can be purchased with the insulin cartridge already in place (these are considered “disposable pens”) and other pens require “loading” of a specific insulin cartridge. Storage of cartridges may or may not require refrigeration. Specific manufacturer’s instructions regarding handling and storage of insulin cartridges must be followed.

Staff training must be done by a registered nurse (preferably a certified diabetes educator) or physician (preferably an endocrinologist).

Note: Parent provides necessary equipment, supplies, and medications.

1. Obtain a blood glucose reading prior to insulin administration.
2. Determine insulin dose with health care provider’s orders.
3. Wash hands.
4. Assemble equipment:
 - Insulin pen device
 - Pen needle
 - Alcohol prep pad
 - Cotton balls or spot bandage (optional)
 - Gloves (if done by anyone other than student)
 - Sharps container
5. Check insulin type/brand. This must match health care provider’s orders.
6. Check the level of insulin remaining in the insulin cartridge.
Cartridges are made for multiple doses. Ensure that enough insulin remains in the cartridge for accurate dosing.
7. Attach new needle. Remove outer plastic cap and plastic needle cap. Place outer cap on a flat surface with open end facing up.
This will assist in needle disposal after insulin is given.
8. Dial in two units of insulin to perform an “air shot” to “prime the pump.” Insulin should appear at needle tip. If it does not, repeat procedure.
Change in temperatures can cause air intake. This procedure ensures that any accumulated air will be released, thereby ensuring accurate insulin dosage.
9. Dial in prescribed dose.
10. Cleanse skin with alcohol and allow to dry before injecting.
11. Pinch up the skin at selected area and dart the needle into the soft pocket at a 90 degree angle.
The soft pocket lies directly in front of or in back of the pinched up skin.
12. Inject insulin at a steady rate.
13. Count slowly to three or five and then remove the needle.
Some pen manufacturers require a longer count.
14. Grasping the pen, place the needle into plastic needle cap that was left upright on a flat surface. Unscrew the needle tip and carefully discard into a sharps container.

Do not lift the cap up with fingers to cover needle tip. Leave cap on the counter and use the pen to place the needle into the cap to avoid possibility of fingerstick injury (see Procedure for One-Handed Needle Recapping). The needle must be changed after each injection, as leaving the pen needle attached leaves an OPEN passageway into the insulin and contamination may occur.

15. Document in student log.

Information about different insulin pens, along with contact information for their manufacturers can be found at www.pedsonline.org.

Sources:

American Diabetes Association. (2003). Care of Children with Diabetes in the School and Day Care Setting. (Position Statement). *Diabetes Care* 26: S131-S135.

American Diabetes Association, in partnership with Metropolitan Educational Cooperative Service Unit. (2003). *Diabetes Care Tasks At School: What Key Personnel Need To Know*. Available at www.diabetes.org/schooltraining.

Zombeck, Mary, in partnership with the California Department of Education and the PADRE Foundation. (April 2002). *The Diabetes School Resource Guide: A guide for managing students with diabetes at school*. Available at www.pedsonline.org.

Insulin Pump Therapy

Definition

Insulin Pump Therapy is also referred to as Continuous Subcutaneous Insulin Infusion (CSII). The pump is worn outside the body and is about the size and weight of a pager. It holds a reservoir of insulin inside the pump and is programmed to deliver the insulin through a thin plastic tube called an infusion set. The infusion set is inserted via a needle that is covered by a cannula just below the skin. Once inserted, the needle is removed and the cannula stays in place for two to three days. When it is time to change the infusion set, a new infusion set is inserted into a different site.

Purpose

The goal of Insulin Pump Therapy is to achieve near normal blood glucose levels over 24 hours per day. The use of CSII has been shown to improve growth in children, decrease the incidence of hypoglycemia, and decrease the incidence of long-term diabetes complications.

The advantages of CSII are that it affords more flexibility of lifestyle with less variability of insulin absorption, more precise insulin administration matched with food intake and activity levels, and overall close attention to diabetes management.

Type of Insulin

The pump uses rapid-acting insulin (such as Humalog or Novolog) as opposed to conventional injections, which typically combine short and longer-acting insulins.

Insulin Pump Therapy combines a continuous basal rate of insulin for 24 hours and a bolus dose for meal or snack times and times of high blood glucose.

Basal rate: Amount of insulin required when no food is eaten; a pre-programmed feature measured in units per hour (U/H); can be altered based on the pumper's daily needs; can be temporarily changed for alteration in schedule activity, illness or food.

Bolus: When the pump is programmed to give a dose of insulin for meals, snacks and /or for correction of elevated blood glucose.

Pump Operation and Maintenance

The specific pump manufacturer instructions must be followed. Manuals, booklets, and videos are usually available free of charge by calling the number listed on the back of the pump.

If the supply of insulin is interrupted due to mechanical pump failure, dislodgment of the cannula, accidental severing of the tubing, or clogged or obstructed tubing, the blood glucose level can rise quickly. In case one of these incidents should occur, it is necessary for extra supplies to be kept at school to prevent or limit the subsequent hyperglycemia and possible ketoacidosis (can occur in as little as 3 hours).

The pump can be disconnected using a quick release set. This is usually done during water activities or contact sports.

A card with the student's name, pump model and serial number, and the pump manufacturer's help line phone number should be readily available in the health office for any problems that might occur. A wallet-sized programming card and an alarm card or manufacturer's instructions should also be available in the health office for reference.

Insulin Pump Skills

Assessment of the following skills can be used in determining a student's ability to independently manage Insulin Pump Therapy:

- Appropriately counts carbohydrates
- Calculates appropriate correction dose based on health care provider orders
- Calculates total dose based on health care provider's orders for carbohydrate consumption and correction dose
- Programs appropriate bolus
- Adjusts temporary rate for exercise
- Disconnects and reconnects tubing
- Inserts new infusion set
- Uses standard precautions
- Fills reservoir and primes tubing
- Trouble shoots alarms appropriately
- Appropriately identifies high and low blood glucose levels

Actions/responsibilities of student and/or parent when student independently manages Insulin Pump Therapy:

- Provide equipment, appropriate information, and medical provider orders to school.
- Proper needle/catheter preparation and insertion
- Programming the pump functions
- Reporting to school personnel (school nurse) any pump malfunctions (dead batteries, high pressure alarm, no delivery, etc.)
- Delivering appropriate insulin amount based on blood glucose testing values, anticipated exercise and planned food consumption
- Caring for skin site
- Inserting a new set if tubing becomes dislodged
- Using standard precautions, including proper disposal of sharps and contaminated wastes
- Ensuring pump/tubing safety during physical activities. If student chooses a quick-release set during activities, he/she will ensure that normal blood glucose is maintained as much as possible (checking blood glucose before, during, and after activities and taking extra carbohydrates as needed).

Sources:

American Diabetes Association. (2003). Care of Children with Diabetes in the School and Day Care Setting. (Position Statement). *Diabetes Care* 26: S131-S135.

American Diabetes Association, in partnership with Metropolitan Educational Cooperative Service Unit. (2003). *Diabetes Care Tasks At School: What Key Personnel Need To Know*. Available at www.diabetes.org/schooltraining.

Zombeck, Mary, in partnership with the California Department of Education and the PADRE Foundation. (April 2002). *The Diabetes School Resource Guide: A guide for managing students with diabetes at school*. Available at www.pedsonline.org.

Procedure for Hypoglycemia with Pump Therapy

1. Follow “Procedure for Low Blood Glucose” and student-specific instructions for low blood glucose while receiving insulin pump therapy. Follow pump-specific directions if pump therapy must be suspended.
Even students who usually function independently may require assistance during hypoglycemia due to mental status changes. School personnel working with diabetic students need to be able to recognize signs of low blood glucose and when to obtain assistance. The pump can be programmed to “suspend” function during exercise so hypoglycemia can be avoided or extra carbohydrates can be consumed for every 30 minutes of exercise.
2. If problems continue, notify the school nurse.
School nurse will notify family and/or health care provider according to student’s individualized health care plan.
3. Document actions.

Sources:

- American Diabetes Association. (2003). Care of Children with Diabetes in the School and Day Care Setting. (Position Statement). *Diabetes Care* 26: S131-S135.
- American Diabetes Association, in partnership with Metropolitan Educational Cooperative Service Unit. (2003). *Diabetes Care Tasks At School: What Key Personnel Need To Know*. Available at www.diabetes.org/schooltraining.
- Zombeck, Mary, in partnership with the California Department of Education and the PADRE Foundation. (April 2002). *The Diabetes School Resource Guide: A guide for managing students with diabetes at school*. Available at www.pedsonline.org.

Procedure for Hyperglycemia with Pump Therapy

1. Check site for leakage, cannula dislodgement, redness and/or tenderness. If any of these are present, have student change the site or call family to change the infusion set immediately. Notify school nurse.
Redness and/or tenderness at the site may indicate obstruction. The blood glucose can rise quickly since the delivery of short-acting insulin has been interrupted and there is no long-acting insulin in the body.
2. If student changes site, he/she must assemble equipment, prime tubing, prep the insertion site, and insert the infusion set using an insertion tool. The cannula can be inserted using an insertion tool. Some pump wearers use an infusion set (such as Silhouette or Tender Twos) that is inserted at an angle with a longer cannula. This is used for those who have less body fat. The Sof-serter cannot be used with these sets.
3. If student cannot change site and family is not available, then a back-up plan for insulin administration must be provided. Refer to student's individualized health care plan.
4. Follow "Procedure for High Blood Glucose" (previous section). Student or parent may program a bolus to correct the hyperglycemia.
5. Check blood glucose 30 minutes – 2 hours after inserting a new infusion set and/or any correction bolus to ensure that blood glucose is responding to insulin.
It may be necessary to continue checking blood glucose levels periodically to prevent potential hypoglycemia.
6. Document actions.

Sources:

- American Diabetes Association. (2003). Care of Children with Diabetes in the School and Day Care Setting. (Position Statement). *Diabetes Care* 26: S131-S135.
- American Diabetes Association, in partnership with Metropolitan Educational Cooperative Service Unit. (2003). *Diabetes Care Tasks At School: What Key Personnel Need To Know*. Available at www.diabetes.org/schooltraining.
- Zombeck, Mary, in partnership with the California Department of Education and the PADRE Foundation. (April 2002). *The Diabetes School Resource Guide: A guide for managing students with diabetes at school*. Available at www.pedsonline.org.

Procedure for Pump Alarms

1. Troubleshoot alarms.

Follow manufacturer's instructions for alarm indication. A reference card can assist with troubleshooting steps of the manufacturer's 800 number can be called (listed on the back of the pump).

LOW BATTERY	Insert new batteries according to instructions.
NO DELIVERY	Check insulin reservoir. If empty, have student or family refill it. If cannula becomes obstructed or kinked, new infusion set must be inserted.

2. If unable to restart pump function or troubleshoot pump, call school nurse so student can be monitored closely and receive appropriate care.
An injection of short-acting insulin may be ordered.
3. Follow "Procedure for High Blood Glucose" if necessary.
4. Document any incidents in student log. Keep school nurse and parents informed of any issues at school.

Contact information for companies that manufacture insulin pumps:

Animas	(877) 937-7867	< http://www.animacorp.com >
Disetronic Medical Systems	(800) 280-7801	< http://www.disetronic-usa.com >
MiniMed	(800) 646-4633	< http://www.minimed.com > (24-hour clinical service phone line 800-826-2099)

Source:

Zombeck, Mary, in partnership with the California Department of Education and the PADRE Foundation. (April 2002). *The Diabetes School Resource Guide: A guide for managing students with diabetes at school*. Available at www.pedsonline.org.

Resources for Teachers, Child Care Providers, Parents, and Health Professionals

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American School Health Association. (2002). *Health in Action: Diabetes and the School Community*. Available online at <http://www.ashaweb.org/miniedition.pdf>. (Copies can be obtained by contacting ASHA at 1-800-445-2745.)

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Virginia Department of Education Office of Special Education and Student Services. (1999). *Manual for Training Public School Employees in the Administration of Insulin and Glucagon*. Available online at <http://www.pen.k12.va.us/VDOE/Instruction/Health/insulin-glucagon.pdf>.

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